

THE GLOBAL PRECIPITATION MEASUREMENT (GPM) PROJECT

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1. INTRODUCTION

The Global Precipitation Measurement (GPM) mission is an international cooperative effort to advance the understanding of the physics of the Earth's water and energy cycle. Accurate and timely knowledge of global precipitation is essential for understanding the weather/climate/ecological system, for improving our ability to manage freshwater resources, and for predicting high-impact natural hazard events including floods, droughts, extreme weather events, and landslides. The GPM **Core Observatory** will be a reference standard to uniformly calibrate data from a constellation of spacecraft with passive microwave sensors. GPM is being developed under a partnership between the United States (US) National Aeronautics and Space Administration (NASA) and the Japanese Aerospace and Exploration Agency (JAXA). NASA's Goddard Space Flight Center (GSFC), in Greenbelt, MD is developing the Core Observatory, two GPM Microwave Imager (GMI) instruments, Ground Validation System and Precipitation Processing System for the GPM mission. JAXA will provide a Dual-frequency Precipitation Radar (DPR) for installation on the Core satellite and launch services for the Core Observatory. The second GMI instrument will be flown on a partner-provided spacecraft. Other US agencies and international partners contribute to the GPM mission by providing precipitation measurements obtained from their own spacecraft and/or providing ground-based precipitation measurements to support ground validation activities. The Precipitation Processing System will provide standard data products for the mission.

2. GPM CORE OBSERVATORY OVERVIEW

The GPM Core Observatory will be placed in a low earth orbit (407 km) with 65-degree inclination, in order to calibrate partner instruments in a variety of orbits. The Core Observatory accommodates GMI and DPR instruments. The GMI instrument is a passive microwave radiometer with hot and cold calibration. GMI provides measurements of precipitation intensity and distribution. The DPR consists of Ka and Ku band radar instruments, and provides three-dimensional measurements of cloud structure, precipitation particle size distribution and precipitation intensity and distribution. The instruments are key drivers for the GPM Core Observatory overall size (13m x 6.5m x 5.0m) and mass (3850kg), as well as the significant (~1950W) power requirement.

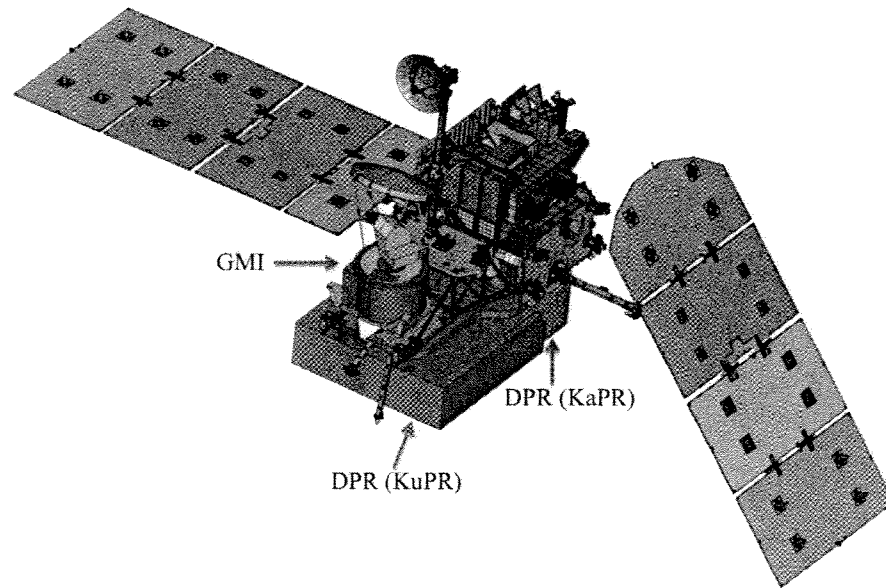


Figure 1, GPM Core Observatory

The Core Spacecraft is being built and tested in-house at Goddard Space Flight Center. The spacecraft structure consists of aluminum panel lower bus/composite tube upper bus structure, two-axis steerable High Gain Antenna System on a dual-hinged boom, and two deployable solar arrays. The propulsion system features four forward and eight aft thrusters and a single Composite Overwrap Pressure Vessel tank. The spacecraft will have a fully redundant avionics, including GSFC-designed Command and Data Handling, Safety/Mechanism/Attitude Control, Power System Electronics, and Global Positioning System, as well as vendor-provided star trackers, sun sensors, and three-axis magnetometers. The GPM Core spacecraft is designed to maximize demiseability (i.e. burning up upon atmospheric reentry as much as possible), although a controlled re-entry will be performed at end of life.

The spacecraft is being designed to be highly reliable over a 3-year mission life, with 5 years capacity for propellant. The Core Observatory will be launched on a Japanese HII-A rocket from Tanegashima, Japan in the summer of 2013. It will be controlled from a Mission Operations Center at GSFC.

3. GPM STATUS

The GPM Project was last presented at IGARSS in 2008 [1]. Since that time, the project's funding has been confirmed by NASA, and the project completed Critical Design Review (CDR) in late 2009. The GMI and DPR instruments have also completed engineering unit/breadboard testing and instrument CDRs. The GPM Ground System (Mission Operations) has completed Preliminary Design Review. The GPM Project has passed key milestones on the way to a GPM Core Observatory launch in July 2013.

6. REFERENCES

- [1] Azarbarzin, A. and C. Carlisle, "The GPM Project," *Global Precipitation Mission I Session, IGARSS 2008*, Boston, July 2008.